

PROCEEDINGS
OF THE
ROYAL SOCIETY OF LONDON
SERIES A
CONTAINING PAPERS OF A MATHEMATICAL AND
PHYSICAL CHARACTER

VOL. LXXVI.

LONDON:
PRINTED FOR THE ROYAL SOCIETY AND SOLD BY
HARRISON AND SONS, ST. MARTIN'S LANE,
PRINTERS IN ORDINARY TO HIS MAJESTY.

December, 1905.

LONDON

HARRISON AND SONS, PRINTERS IN ORDINARY TO HIS MAJESTY,
ST. MARTIN'S LANE.

CONTENTS.

SERIES A. VOL. LXXVI.



No. A 507.—April 22, 1905.

	PAGE
Address delivered by the President, Sir William Huggins, K.C.B., O.M., F.R.S., at the Anniversary Meeting on November 30, 1904	1
The Boring of the Simplon Tunnel, and the Distribution of Temperature that was encountered. By Francis Fox, M.Inst.C.E. Communicated by C. V. Boys, F.R.S.	29
On a Method of Finding the Conductivity for Heat. By Professor C. Niven, F.R.S.	34
Theory of the Reflection of Light near the Polarising Angle. By Richard C. Maclaurin, M.A., LL.D., Fellow of St. John's College, Cambridge, Professor of Mathematics, Wellington, New Zealand. Communicated by Professor J. Larmor, Sec. R.S.	49
On the Relation between Variations of Atmospheric Pressure in North-East Africa and the Nile Flood. By Captain H. G. Lyons, Director General Survey Department of Egypt. Communicated by Dr. W. N. Shaw, F.R.S., by permission of Sir W. E. Garstin, G.C.M.G., Adviser, Public Works Ministry. (Plate 1)	66

No. A 508.—May 24, 1905.

On the Radio-active Minerals. By the Hon. R. J. Strutt, Fellow of Trinity College, Cambridge. Communicated by Lord Rayleigh, O.M., F.R.S.	88
The Rate of Transmission of the Guatemala Earthquake, April 19, 1902. By R. D. Oldham. Communicated by Professor John Milne, F.R.S.	102
A Determination of the Amounts of Neon and Helium in Atmospheric Air. By Sir William Ramsay, K.C.B., F.R.S.	111
A New Radio-Active Element, which Evolves Thorium Emanation. Preliminary Communication. By O. Hahn, Ph.D. Communicated by Sir William Ramsay, K.C.B., F.R.S.	115
On the Spectrum of Silicon ; with a Note on the Spectrum of Fluorine. By Joseph Lunt, B.Sc., F.I.C. Communicated by Sir David Gill, K.C.B., F.R.S., H.M. Astronomer at the Cape of Good Hope. (Plate 2).....	118
The Basic Gamma-Function and the Elliptic Functions. By the Rev. F. H. Jackson, R.N. Communicated by Professor A. R. Forsyth, Sc.D., LL.D., F.R.S.	127

	PAGE
Further Researches on the Temperature Classification of Stars. No. 2. By Sir Norman Lockyer, K.C.B., Hon. LL.D. (Glasgow), Hon. Sc.D. (Camb.), F.R.S. (Plate 3)	145
On Some Continuous Observations of the Rate of Dissipation of Electric Charges in the Open Air. By C. Coleridge Farr, D.Sc. Communicated by Dr. C. Chree, F.R.S.	152
Atmospheric Electricity in High Latitudes. By George C. Simpson, B.Sc. Communicated by Arthur Schuster, F.R.S. (Abstract)	160
Note on Fluorescence and Absorption. By John Butler Burke, M.A. Communicated by Professor Larmor, Sec. R.S.	165
The Direct Synthesis of Ammonia. By Edgar Philip Perman, D.Sc., Assistant Professor of Chemistry at University College, Cardiff. Communicated by Principal E. H. Griffiths, F.R.S.	167
Determination of Vapour-pressure by Air-bubbling. By Edgar Philip Perman and John Hughes Davies. Communicated by Principal E. H. Griffiths, F.R.S.	174
On the Observations of Stars made in some British Stone Circles.—Preliminary Note. By Sir Norman Lockyer, K.C.B., F.R.S., LL.D., Sc.D.	177

No. A 509.—June 28, 1905.

Report on an Area of Local Magnetic Disturbance in East Loch Roag, Lewes, Hebrides. By Captain Arthur Mostyn Field, Royal Navy. Communicated by Rear-Admiral Sir William Wharton, K.C.B., F.R.S.	181
The Determination of the Specific Heat of Superheated Steam by Throttling and other Experiments. By A. H. Peake, M.A., A.I.E.E. Communicated by Professor Ewing, F.R.S.	185
On the Distribution of Velocity in a Viscous Fluid over the Cross-Section of a Pipe, and on the Action at the Critical Velocity. By John Morrow, M.Sc. (Vict.), M.Eng. (Liverpool), Lecturer in Engineering, University College, Bristol. Communicated by Professor H. S. Hele-Shaw, F.R.S.	205
The Theory of Photographic Processes, Part II : On the Chemical Dynamics of Development, including the Microscopy of the Image. By S. E. Sheppard, B.Sc., and C. E. K. Mees, B.Sc. Communicated by Sir William Ramsay, K.C.B., F.R.S. (Plate 4).....	217
On a New Type of Electric Furnace, with a Redetermination of the Melting-Point of Platinum. By J. A. Harker, D.Sc., Joule Student of the Royal Society, Assistant at the National Physical Laboratory, Teddington. Communicated by R. T. Glazebrook, D.Sc., F.R.S. Prom the National Physical Laboratory ...	235
The Atomic Weight of Chlorine : An Attempt to Determine the Equivalent of Chlorine by Direct Burning with Hydrogen. By Harold B. Dixon, M.A., F.R.S. (late Fellow of Balliol College, Oxford), Professor of Chemistry, and E. C. Edgar, B.Sc., Dalton Scholar of the University of Manchester (Abstract)	250

No. A 510.—July 10, 1905.

	PAGE
Thorianite, a New Mineral from Ceylon. By Wyndham R. Dunstan, M.A., LL.D., F.R.S., and G. S. Blake, A.R.S.M., Assistant in the Scientific and Technical Department of the Imperial Institute	253
The Perturbations of the Bielid Meteors. By A. M. W. Downing, D.Sc., F.R.S.....	266
On the Magnetic Qualities of some Alloys not Containing Iron. By J. A. Fleming, M.A., D.Sc., F.R.S., and R. A. Hadfield, M.Inst.C.E.	271
Preliminary Notes on Observations made with a Horizontal Pendulum in the Antarctic Regions. By J. Milne, F.R.S.	284
On the Application of Statistical Mechanics to the General Dynamics of Matter and Ether. By J. H. Jeans, M.A., Fellow of Trinity College, Cambridge. Communicated by Professor J. Larmor, Sec. R.S.	296
Note Supplementary to a Paper "On the Radio-Active Minerals." By the Hon. R. J. Strutt, F.R.S., Fellow of Trinity College, Cambridge	312
On the Intensity and Direction of the Force of Gravity in India. By Lieut.-Colonel S. G. Burrard, R.E., F.R.S. (Abstract)	313
Modified Apparatus for the Measurement of Colour, and its Application to the Determination of the Colour Sensations. By Sir William de W. Abney, K.C.B., D.C.L., D.Sc., F.R.S. (Abstract).....	315
On the Thermo-electric Junction as a Means of Determining the Lowest Temperatures. By Sir James Dewar, M.A., D.Sc., LL.D., F.R.S.	316
Studies with the Liquid Hydrogen and Air Calorimeters. By Sir James Dewar, M.A., Sc.D., LL.D., F.R.S.	325

No. A 511.—August 4, 1905.

Explosions of Mixtures of Coal-Gas and Air in a Closed Vessel. By Leonard Bairstow, A.R.C.Sc., Wh. Sch., and A. D. Alexander, A.R.C.Sc., Wh. Sch. Communicated by Professor Perry, F.R.S. (Abstract).....	340
The Improved Electric Micrometer. By P. E. Shaw, B.A., D.Sc. Communicated by Professor J. H. Poynting, F.R.S.	350
The Amplitude of the Minimum Audible Impulsive Sound. By P. E. Shaw, B.A., D.Sc. Communicated by Professor J. H. Poynting, F.R.S.	360
Note on Dr. H. A. Wilson's Memoir "On the Electric Effect of Rotating a Dielectric in a Magnetic Field." By S. J. Barnett, Palo Alto, California, U.S.A. Communicated by Professor Larmor, Sec. R.S.	367
Colours in Metal Glasses, in Metallic Films, and in Metallic Solutions.—II. By J. C. Maxwell Garnett. Communicated by Professor J. Larmor, Sec. R.S. (Abstract)	370
The Evolution of the Spectrum of a Star during its Growth from a Nebula. By W. E. Wilson, D.Sc., F.R.S.	374
Researches on Explosives.—Part III. By Sir Andrew Noble, Bart., K.C.B., F.R.S., D.Sc., etc. (Abstract)	381

	PAGE
The Analogy between Lesage's Theory of Gravitation and the Repulsion of Light. By G. H. Darwin, F.R.S., Plumian Professor and Fellow of Trinity College, in the University of Cambridge	387
On the Phosphorescent Spectra of S δ and Europium. By Sir William Crookes D.Sc., F.R.S.	411
Records of Difference of Temperature between McGill College Observatory and the Top of Mount Royal, Montreal. By Professor C. McLeod, F.R.S. Can. Com- municated by Professor H. L. Callendar, F.R.S.	415

No. A 512.—September 13, 1905.

The Elastic Properties of Steel at High Temperatures. By Bertram Hopkinson, M.A., M.I.C.E., Professor of Mechanism and Applied Mechanics in the Univer- sity of Cambridge, and F. Rogers, B.A. (Cantab.), M.Sc., M.Eng. Communi- cated by Professor Ewing, F.R.S.	419
On the Refractive Index of Gaseous Fluorine. By C. Cuthbertson and E. B. R. Prideaux, M.A., B.Sc. Communicated by Sir William Ramsay, K.C.B., F.R.S. (Abstract).....	426
The Absorption Spectrum and Fluorescence of Mercury Vapour. By W. N. Hartley, D.Sc., F.R.S.	428
The Formation of Ice and the Grained Structure of Glaciers. By G. Quincke, For. Mem. R.S., Professor of Physics in the University of Heidelberg	431
On the Influence of Collisions and of the Motion of Molecules in the Line of Sight, upon the Constitution of a Spectrum Line. By Lord Rayleigh, O.M., F.R.S. ...	440
An Experiment with the Balance to Find if Change of Temperature has any Effect upon Weight. By J. H. Poynting, Sc.D., F.R.S., and Percy Phillips, M.Sc. ...	445
A New Formation of Diamond. By Sir William Crookes, Hon. D.Sc. (Oxford and Dubl.), F.R.S.	458
The Influence of Phase Changes on the Tenacity of Ductile Metals at the Ordinary Temperature and at the Boiling Point of Liquid Air. By G. T. Beilby and H. N. Beilby, B.Sc. Communicated by Professor J. Larmor, Sec. R.S. (Plate 5)	462
The Refractive Indices of Sulphuric Acid at Different Concentrations. By V. H. Veley, F.R.S., and J. J. Manley, M.A.	469
On the Spectrum of the Spontaneous Luminous Radiation of Radium. Part III.— Radiation in Hydrogen. By Sir William Huggins, K.C.B., O.M., D.C.L., Pres. R.S., and Lady Huggins, Hon. Mem. R.A.S.	488

No. A 513.—December 6, 1905.

The Pressure of Explosions.—Experiments on Solid and Gaseous Explosives. By J. E. Petavel. Communicated by Arthur Schuster, F.R.S. (Abstract)	492
The Flow of the River Thames in Relation to British Pressure and Rainfall Changes. By Sir Norman Lockyer, K.C.B., LL.D., Sc.D., F.R.S., and William J. S. Lockyer, M.A. (Camb.), Ph.D. (Gött.), F.R.A.S. (Plates 6 and 7)	494

	PAGE
Preliminary Report on a Survey of Magnetic Declination near the Royal Alfred Observatory, Mauritius. By Thomas Folkes Claxton, Director. Communicated by Dr. C. Chree, F.R.S.	507
Researches on Explosives. Part III.—Supplementary Note. By Sir Andrew Noble, Bart., K.C.B., F.R.S., F.R.A.S.	512
On Newton's Rings formed by Metallic Reflection. By Richard C. Maclaurin, M.A., LL.D., late Fellow of St. John's College, Cambridge, Professor of Mathematics, Wellington, New Zealand. Communicated by Professor J. Larmor, Sec. R.S... ..	515
On the Laws of Radiation. By J. H. Jeans, M.A., Fellow of Trinity College, Cambridge, Professor of Applied Mathematics in the University of Princeton. Communicated by Professor J. Larmor, Sec. R.S.	545
The Transit of Ions in the Electric Arc. By A. A. Campbell Swinton. Communicated by the Hon. C. A. Parsons, C.B., F.R.S.	553
The Accurate Measurement of Ionic Velocities. By R. B. Denison, M.Sc., Ph.D., and B. D. Steele, D.Sc. Communicated by Sir William Ramsay, K.C.B., F.R.S. (Abstract)	556
The Physical and Chemical Properties of Iron Carbonyl. By Sir James Dewar, M.A., Sc.D., LL.D., F.R.S., Jacksonian Professor in the University of Cambridge, and Humphrey Owen Jones, M.A., D.Sc., Fellow of Clare College, and Jacksonian Demonstrator in the University of Cambridge	558
The Electrical Conductivity of Dilute Solutions of Sulphuric Acid. By W. C. D. Whetham, M.A., F.R.S.	577
Index	585
